# Microprocessor Supervisory Circuit in 4-Pin SOT143

## Advance Technical Information

# ADM811/ADM812

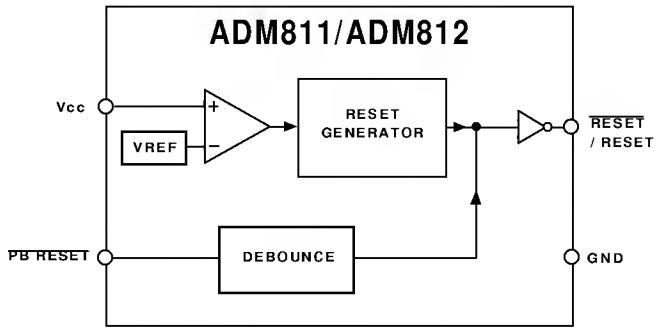
### FEATURES

**Superior Upgrade for MAX811/MAX812**
**Specified Over Temperature**
**Low Power Consumption ( 6µA typical )**
**Precision Voltage Monitor**
**+3V, +3.3V, +5V Options**
**Reset Assertion Down to 1 V $V_{CC}$**
**140ms min Power-On Reset**
**Logic Low RESET Output (ADM811)**
**Logic High RESET Output (ADM812)**
**Built-in manual reset**

### APPLICATIONS

**Microprocessor Systems**
**Controllers**
**Intelligent Instruments**
**Automotive Systems**
**Safety Systems**
**Portable instruments**

### FUNCTIONAL BLOCK DIAGRAM



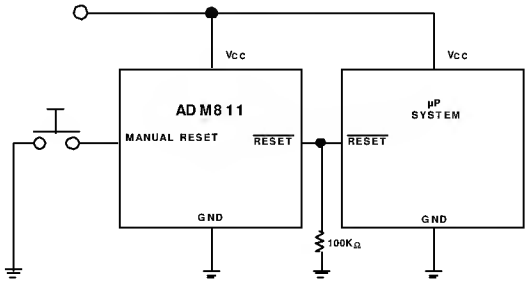

### GENERAL DESCRIPTION

The ADM811/ADM812 are reliable voltage monitoring devices which are suitable for use in most voltage monitoring applications.

The ADM811/ADM812 is designed to monitor 5 different voltages, each allowing for a 5% or 10% degradation of standard PSU voltages. These voltages have been carefully selected for the effective monitoring of +3V, +3.3V and +5V supply voltage levels.

Included in this circuit is a debounced Manual Reset input. Reset will be activated with an ordinary mechanical switch (or an input from another digital device) or a degredation of the supply voltage. The Manual Reset function is very useful especially if the circuit in which the ADM811/ ADM812 is operating in, enters into a state that can only be detected by the user. Allowing the user to manually reset a system can reduce the damage or danger that could be otherwise be caused by an out of control or locked-up system.

### TYPICAL OPERATING CIRCUIT



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($V_{CC}$ = Full Operating Range, $T_A = T_{MIN}$ to $T_{MAX}$ unless otherwise noted) $V_{CC}$ TYP = 5V for L/M, 3.3V for T/S, 3V for R Models

# ADM811/ADM812–SPECIFICATIONS

| Parameter | Min | Typ | Max | Units | Test Conditions/Comments |
|---|---|---|---|---|---|
| Supply | | | | | |
| Voltage | 1.0 | | 5.5 | V | $T_A$ = 0°C to +70°C |
| | 1.2 | | | V | $T_A$ = -40°C to +85°C |
| Current | | 6 | 15 | µA | $V_{CC}$ < 5.5V, ADM81_L/M, $I_{out}$=0A |
| | | 2.7 | 10 | µA | $V_{CC}$ < 3.6V, ADM81_R/S/T, $I_{out}$=0A |
| $V_{CC}$ max transient duration | | 100 | | µs | $T_A$ =25°C Reset comparator overdrive <2.4V |
| RESET VOLTAGE THRESHOLD | | | | | |
| ADM81_L | 4.54 | 4.63 | 4.72 | V | $T_A$ = +25°C |
| ADM81_L | 4.5 | | 4.75 | V | $T_A$ = 0°C to +85°C |
| ADM81_M | 4.30 | 4.38 | 4.46 | V | $T_A$ = +25°C |
| ADM81_M | 4.25 | | 4.5 | V | $T_A$ = 0°C to +85°C |
| ADM81_T | 3.03 | 3.08 | 3.14 | V | $T_A$ = +25°C |
| ADM81_T | 3.00 | | 3.15 | V | $T_A$ = 0°C to +85°C |
| ADM81_S | 2.88 | 2.93 | 2.98 | V | $T_A$ = +25°C |
| ADM81_S | 2.85 | | 3.00 | V | $T_A$ = 0°C to +85°C |
| ADM81_R | 2.58 | 2.63 | 2.68 | V | $T_A$ = +25°C |
| ADM81_R | 2.55 | | 2.70 | V | $T_A$ = 0°C to +85°C |
| Reset Threshold Temperature Coef. | | 30 | | ppm/°C | |
| $V_{CC}$ to RESET/RESET Delay | | 40 | | µs | $V_{OD}$ = 125mV, ADM81_L/M |
| | | 20 | | µs | $V_{OD}$ = 125mV, ADM81_R/S/T |
| Reset Active Timeout Period | 140 | | 560 | ms | $V_{CC} = V_{TH(MAX)}$ |
| Manual Reset | | | | | |
| Minimum Pulse Width | 10 | | | µs | |
| Glitch Immunity | | 100 | | ns | |
| RESET/RESET Propagation Delay | | 0.5 | | µs | |
| Pull-up resistance | 10 | 20 | 30 | KW | |
| The Manual Reset circuit will act on | | | | | |
| An input rising above | 2.3 | | | V | $V_{CC} > V_{TH(MAX)}$, ADM81_L/M |
| An input falling below | | | 0.8 | V | $V_{CC} > V_{TH(MAX)}$, ADM81_L/M |
| An input rising above | $0.7xV_{CC}$ | | | V | $V_{CC} > V_{TH(MAX)}$, ADM81_R/S/T |
| An input falling below | | | $0.25xV_{CC}$ | V | $V_{CC} > V_{TH(MAX)}$, ADM81_R/S/T |
| RESET Output Voltage | | | | | |
| Low (ADM812R/S/T) | | | 0.3 | V | $V_{CC} = V_{TH(MAX)}$, $I_{SINK}$ = 1.2mA |
| Low (ADM812L/M) | | | 0.4 | V | $V_{CC} = V_{TH(MAX)}$, $I_{SINK}$ = 3.2mA |
| High(ADM812R/S/T/L/M) | $0.8V_{CC}$ | | | V | $1.8V<V_{CC}<V_{TH(MIN)}$, $I_{SINK}$ = 150µA |
| Low (ADM811R/S/T) | | | 0.3 | V | $V_{CC} = V_{TH(MIN)}$, $I_{SINK}$ = 1.2mA |
| Low (ADM811L/M) | | | 0.4 | V | $V_{CC} = V_{TH(MIN)}$, $I_{SINK}$ = 3.2mA |
| Low (ADM811R/S/T/L/M) | | | 0.3 | V | $V_{CC}$>1.0V, $I_{SINK}$ = 50µA |
| High (ADM811R/S/T) | $0.8V_{CC}$ | | | V | $V_{CC}>V_{TH(MAX)}$, $I_{SOURCE}$ = 500µA |
| High (ADM811L/M) | $V_{CC}$-1.5 | | | V | $V_{CC}>V_{TH(MAX)}$, $I_{SOURCE}$ = 800µA |

## ABSOLUTE MAXIMUM RATINGS*

($T_A$ = +25°C unless otherwise noted)

Terminal Voltage (with respect to ground)

$V_{CC}$ ..... –0.3 V to +6 V
All other inputs ..... –0.3 V to Vcc + 0.3 V

Input Current

$V_{CC}$ ..... 20 mA
MR ..... 20mA

Output Current

RESET, RESET ..... 20 mA

Power Dissipation ($T_A$ = +70°C),
RT-3 SOT23 ..... 200 mW
Derate by 4mW/°C above 70°C
$\theta_{JA}$ Thermal Impedance ..... 330°C/W

Operating temperature range ..... -40°C to +85°C
Storage temperature range ..... –65°C to +160°C
Lead Temperature (Soldering, 10 secs) ..... +300°C
Vapor Phase (60 secs) ..... +215°C
Infrared (15 secs) ..... +220°C

*Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum ratings for extended periods of time may affect device reliability.

## Typical Performance Characteristics

*Figure 2. Supply Current vs. Temperature (ADM81_R/S/T) (No Load)*

*Figure 3. Supply Current vs. Temperature (ADM81_L/M) (No Load)*

*Figure 4. Power-Down RESET Delay vs. Temperature (ADM81_R/S/T)*

*Figure 5. Power-Down RESET Delay vs. Temperature ADM8__L/M*

*Figure 6. Power-Up Reset Timeout vs. Temperature*

*Figure 7. Reset Threshold Deviation vs. Temperature*

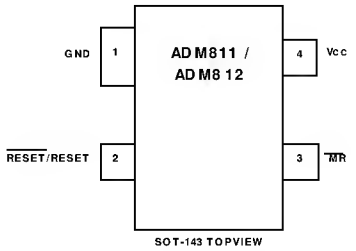
*Figure 8. Reset Output Voltage vs. Supply Voltage*

*Figure 9. Maximum Transient Duration Without causing a Reset Pulse vs. Reset Comparator Overdrive.*

*Figure 10. Power-Up RESET Active Time vs. Temperature*

**PIN FUNCTION DESCRIPTION**

| Pin | Mnemonic | Function |
|---|---|---|
| 1 | GND | 0 V. Ground reference for all signals. |
| 2 | RESET(ADM811) | Active Low Logic Output. RESET remains low while $V_{CC}$ is below the reset threshold or when MR is low, RESET then remains low for 240ms (typ) after $V_{CC}$ rises above the reset threshold |
| 2 | RESET(ADM812) | Active High Logic Output. RESET remains high while $V_{CC}$ is below the reset threshold or when MR is low, RESET then remains high for 240ms (typ) after $V_{CC}$ rises above the reset threshold |
| 3 | MR | Manual Reset. This active low debounced input will ignore input pulses of 100ns or less (typical) and is guaranteed to accept input pulses of greater than 10µs. Leave floating when not used. |
| 4 | $V_{CC}$ | +3V, +3.3V or +5V monitored supply voltage. |




**PIN CONFIGURATION**

**Table I. Reset Threshold Options**

| Model | RESET Threshold |
|---|---|
| ADM811LART | 4.63 V |
| ADM811MART | 4.38 V |
| ADM811TART | 3.08 V |
| ADM811SART | 2.93 V |
| ADM811RART | 2.63 V |
| ADM812LART | 4.63 V |
| ADM812MART | 4.38 V |
| ADM812TART | 3.08 V |
| ADM812SART | 2.93 V |
| ADM812RART | 2.63 V |

## CIRCUIT INFORMATION

### RESET THRESHOLDS

The reset output provides a RESET (for the ADM811) or a RESET (for the ADM812) output to the microprocessor whenever the $V_{CC}$ input is below the reset threshold. The actual reset threshold is dependant on whether a L, M, T, S or R suffix is used. Please refer to Table 1.

### RESET OUTPUT

On power-up and after $V_{CC}$ rises above the reset threshold, an internal timer holds the reset output active for 240ms . This is intended as a power-on reset signal for the processor. It allows time for both the power supply and the microprocessor to stabilize after power-up. If a power supply brownout or interruption occurs, the reset output is similarly activated and remains active for 240ms after the supply recovers. This allows time for the power supply and microprocessor to stabilize.

The ADM811 provides an active low reset output (RESET ) while the ADM812 provides an active high output (RESET)

On the ADM811, during power-down, the RESET output remains valid (low) with $V_{CC}$ as low as 1 V. This ensures that the microprocessor is held in a stable shutdown condition as the supply falls and also ensures that no spurious activity can occur via the µP as it powers up.

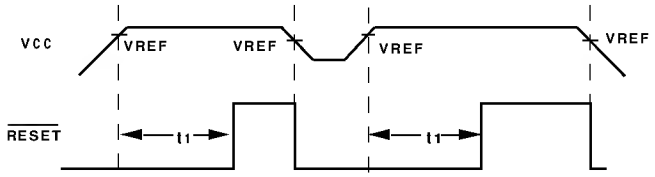
### MANUAL RESET

The ADM811 and ADM812 are equiped with a manual reset input. This input is designed to operate in a noisey environment where unwanted glitches could be induced. These glitches could be produced by the bouncing action of a switch contact or where a Manual Reset switch may be located some distance away from the circuit (the cabeling of which may pick up noise)

The Manual Reset input is guaranteed to ignore logically valid inputs which are faster than 100ns and accept inputs longer in duration than 10µs.

### GLITCH IMMUNITY

The ADM811/ADM812 contains internal filtering circuitry providing glitch immunity for fast transient glitches on the power supply line. Figure 9 shows the comparator response time for short transients.




t1 = RESET TIME = 240MS TYP.
VREF = RESET VOLTAGE THRESHOLD

*Figure 1. Power Fail Reset Timing*

## INTERFACING TO OTHER DEVICES

### OUTPUT

The ADM811 and ADM812 series is designed to integrate with as many devices as possible. One feature of the ADM811 and ADM812 is the reset output which is directily proportional to $V_{cc}$ (this is guaranteed only while $V_{cc}$ is greater than 1V). This enables the part to be used in both 3V and 5V or any Nominal Voltage within the Minimum and Maximum Specifications for $V_{cc}$.

Because of this design approach, the ADM811 and ADM812 is capable of operating correctily in any circuit where the reset output voltages are required to be between ground or $V_{cc.}$

### THE BENEFITS OF A VERY ACCURATE RESET THRESHOLD

In other Microprocessor Reset Circuits, tolerances in supply voltages can lead to an overall increase in Reset tolerence levels due to inappropriate power supply levels at the Microprocessor supervisory circuit power supply. Because the ADM811 and ADM812 series can operate effectively even when there are large degradations of the supply voltages, the possibility of a malfunction during a power failure is greatly reduced. Another advantage of the ADM811 and ADM812 Series is its very accurate internal voltage reference circuit. Combined, these benifits produce an exceptionally reliable Microprocessor Supervisory Circuit.

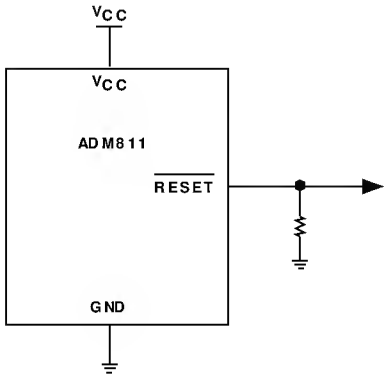



*Figure 10. Ensuring a Valid Reset Output Down to $V_{cc}$=0V*

### ENSURING A VALID RESET OUTPUT DOWN TO $V_{CC}$=0V

When Vcc falls below 0.8V, ADM811s RESET no longer sinks current. Therefore a high impedance CMOS logic input connected to Reset may drift to undetermined logic levels. To eliminate this problem a 100KW Resistor should be connected from RESET to ground.

### ORDERING GUIDE

| Model* | Reset Threshold | Temperature Range | Brand Information | Quantity |
|---|---|---|---|---|
| ADM811LART-REEL | 4.63 V | –40°C to +85°C | 9LXX | 10K |
| ADM811LART-REEL-7 | 4.63 V | –40°C to +85°C | 9LXX | 3K |
| ADM811MART-REEL | 4.38 V | –40°C to +85°C | 9MXX | 10K |
| ADM811MART-REEL-7 | 4.38 V | –40°C to +85°C | 9MXX | 3K |
| ADM811TART-REEL | 3.08 V | –40°C to +85°C | 9TXX | 10K |
| ADM811TART-REEL-7 | 3.08 V | –40°C to +85°C | 9TXX | 3K |
| ADM811SART-REEL | 2.93 V | –40°C to +85°C | 9SXX | 10K |
| ADM811SART-REEL-7 | 2.93 V | –40°C to +85°C | 9SXX | 3K |
| ADM811RART-REEL | 2.63 V | –40°C to +85°C | 9RXX | 10K |
| ADM811RART-REEL-7 | 2.63 V | –40°C to +85°C | 9RXX | 3K |
| ADM812LART-REEL | 4.63 V | –40°C to +85°C | ALXX | 10K |
| ADM812LART-REEL-7 | 4.63 V | –40°C to +85°C | ALXX | 3K |
| ADM812MART-REEL | 4.38 V | –40°C to +85°C | AMXX | 10K |
| ADM812MART-REEL-7 | 4.38 V | –40°C to +85°C | AMXX | 3K |
| ADM812TART-REEL | 3.08 V | –40°C to +85°C | ATXX | 10K |
| ADM812TART-REEL-7 | 3.08 V | –40°C to +85°C | ATXX | 3K |
| ADM812SART-REEL | 2.93 V | –40°C to +85°C | ASXX | 10K |
| ADM812SART-REEL-7 | 2.93 V | –40°C to +85°C | ASXX | 3K |
| ADM812RART-REEL | 2.63 V | –40°C to +85°C | ARXX | 10K |
| ADM812RART-REEL-7 | 2.63 V | –40°C to +85°C | ARXX | 3K |

*Only available in Reels.